

What is claimed is:

1) A semi-crystalline, largely isotropic, porous coal-based product produced from particulate coal exhibiting a free swell index of between about 3.5 and about 5.0 and of a small diameter, having a density of between about 0.1 and about 0.8 g/cm₃ and a thermal conductivity below about 1 W/m/°K.

2) The porous coal-based product of claim 1 wherein said coal exhibits a free swell index of between about 3.75 and about 4.5.

3) The porous coal-based product of claim 2 having a compressive strength below about 6000 psi.

4) The porous coal-based product of claim 2 that has been carbonized.

5) The porous coal-based product of claim 2 that has been graphitized.

6) A method for producing a porous coal-based product from coal exhibiting a free swell index of between about 3.5 and about 5.0 comprising:

A) comminuting said coal to a small particle size to form a ground coal;

B) placing said ground coal in a mold;

- C) heating said ground coal in said mold under a non-oxidizing atmosphere to a temperature of between about 300° C and about 700° C and soaking at this temperature for a period of from about 10 minutes to about 12 hours to form a preform; and
- D) controllably cooling said preform.

7) The method of claim 6 wherein said coal exhibits a free swell index of between about 3.75 and about 4.5.

8) The method of claim 7 wherein said inert atmosphere is applied at a pressure of from about 0 psi up to about 500 psi.

9) The method of claim 7 wherein said temperature is achieved using a heat-up rate of between about 1° C to about 20° C per minute.

10) The method of claim 7 wherein said controlled cooling is accomplished at a rate of less than about 10° C/min to a temperature of about 100° C.

11) A laminated sheet comprising:

- A) a pair of skins laminated to either side of;
- B) a core of a semi-crystalline, largely isotropic, porous coal based product produced from particulate coal

exhibiting a free swell index of between about 3.5 and about 5.0 and of a small diameter, having a density of between about 0.1 and about 0.8 g/cm³ and a thermal conductivity below about 1 W/m/°K.

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12) The laminated sheet product of claim 11 wherein said coal exhibits a free swell index of between about 3.75 and about 4.5.

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13) The laminated sheet product of claim 12 wherein said skins comprise a material selected from the group consisting of aluminum, steel, polymer sheet, inconel, titanium, refractory metals, fiber reinforced polymer sheet and paper.

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14) The laminated sheet product of claim 12 wherein said sheet core has been carbonized.

15) The laminated sheet product of claim 12 wherein said sheet core is graphitized.